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a case of riparian landscape restoration on privately owned land with public access**

Gamborg, Christian; Morsing, Jonas; Raulund-Rasmussen, Karsten

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Adjustive ecological restoration through stakeholder involvement. A case of riparian landscape restoration on privately owned land with public access

Running head: Adjustive ecological restoration

Authors and addresses:

Christian Gamborg^{a*}, Jonas Morsing^b and Karsten Raulund-Rasmussen^b

^aDept. of Food and Resource Economics, University of Copenhagen

^bDept. of Geosciences and Natural Resource Management, University of Copenhagen,

*Corresponding author: chg@ifro.ku.dk, Rolighedsvej 25, DK-1958 Frederiksberg C, Denmark.

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Abstract:

Ecological restoration involves a dual uncertainty or disagreement, one connected to changes in the environment and in human expertises, and another related to changes in views of acceptability over time and underlying value disagreements. While the former often is attended to under the notion of adaptive management, the latter is less often considered. The aim of this paper is to investigate how a continuous involvement process can facilitate adjustments of ecological restoration, taking into

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account the values of all parties involved. Using a combination of a survey distributed to stakeholders in the involvement process and content analysis of the minutes from the series of meetings of the involvement process, the concerns and views of stakeholders, and the kinds of adjustment, which took place, were identified. Stakeholders were generally positive about being involved but expressed various concerns about the restoration approach itself, especially the open-endedness, and about specific interventions. Three types of adjustments were identified: (1) project managers adjusted activities based on stakeholders' raised concerns and values; (2) stakeholders modified views in response to project managers as the restoration project proceeded; and (3) shifts in views took place within the stakeholder group based on exchanges with other stakeholders involved in the project. Mutual benefits and a higher level of mutual understanding were reached through the approach we call 'adjustive ecological restoration'. This approach depends on the ability to work with stakeholders, willingness to adjust, high levels of trust, and the levelling of expectations at the beginning of the process.

Key words:

attitudes, engagement, green partnership, social-ecological system, stream restoration, values

Implications:

- A continuous involvement process provides a foundation for values and concerns of the involved parties to be brought forward, allowing for adjustments of ecological restoration

- Three possible types of adjustments: (1) project managers adjust restoration activities based on stakeholders' concerns and values, (2) stakeholders modify views in response to project managers, (3) shifts in views within the stakeholder group based on exchanges with other stakeholders involved.
- Adjustive ecological restoration depends on at least four enablers: (a) the ability to work with stakeholders and record their values and concerns, (b) a willingness to adjust values and restoration activities, (c) high levels of trust between the parties, (d) levelling of expectations about just how much influence can be exerted.

Introduction

Over the past decades, ecological restoration has received unprecedented attention from scientists, habitat managers, landowners, policy makers and stakeholders, and has become one of the preferred methods of conservation (Allison & Murphy 2017). So far, ecological and technical aspects have dominated research in ecological restoration, and the human sphere and nature have been treated as largely separate domains (Standish et al. 2013). Social aspects have been addressed less or overlooked (O'Rourke 2014). However, there is a growing interest in the social side of restoration (Petursdottir et al. 2013a; 2013b; Reed et al. 2018). This can be seen as a form of recognition that what, for one person or group, is 'restoration' may be seen as a 'destruction' by others (Sayer 2005). It may reflect that societies are becoming more pluralist in the interests and values citizens connect with the idea of 'good' nature (Gamborg & Sandøe 2004). It may also indicate a more fundamental divide between adherents of ecological restoration or preservation as the right, or permissible, way to manage or relate to nature (Baldwin et al. 1994; Kane 1994).

Philosophers, such as Elliot (1982, 1997), have forcefully argued that ecological restoration results in a kind of "faked nature" and should be seen as yet another sign of human domination (Katz (1996; 2002). The way we should conceive of nature and how we ought to interact with it, may take an anthropocentric outlook (Light 2000, 2003; Swart et al. 2001) claiming that nature has merely instrumental value to humans, but that we can act in ways which benefit both humans and nature (Keulartz 2012). Hence, ecological restoration can be a method to make up for former mistakes and improvements of nature. From a non-anthropocentric perspective, nature is seen as having more than instrumental value to humans. Nature can be seen as something worthy of moral consideration,

deserving respect as individual living organisms (e.g. Taylor 1986) or in a holistic sense (Leopold 1949; Callicott 1989). However, this dichotomy may not reflect or capture the relevant complexity surrounding our interactions with nature, at a more concrete or practical level (Daugstad et al. 2006). In fact, disagreements over restoration may reflect differences in protection interests, for example birds versus plants, between protection interests and recreational interests, or between different types of natural value (Marttila et al. 2016; Drouineau et al. 2018; Paudyal et al. 2018). Conflicts may also abound over concrete, yet perhaps less tangible values, such as aesthetic values (Gobster et al. 2007) or concerns over place attachment and loss of meaning (Drenthen 2009) versus more psychological values such as cooperation (Miles et al. 2000) and building of a conscience of so-called ecological citizenship (Light 2002).

Ecological restoration may be considered a complex or even wicked problem in the sense of Rittel & Webber (1973), that is an issue which cannot be technically or scientifically ‘fixed’, with only good and bad solutions, but instead an issue where dynamics in knowledge and values play an important role for how progress can be made. Therefore, it is important to examine the interaction between involvement in restoration as a means of preventing or mitigating potential conflicts (Harris et al. 2012; Ban et al. 2013; Frey & Berkes 2014; Harmsworth et al. 2016; Smith et al. 2016).

Ecological restoration can be seen as involving two kinds of uncertainty or disagreement. Technical and ecological uncertainties lie on one side and may relate to the physical habitat (Darby & Shear 2008), or, for example, how to establish a viable population of predator birds in a managed

landscape. In relation to this type of uncertainty, adaptive management seeks to take into account changes in evidence and changes in the environment when making decisions (Zedler 2017).

Essentially, it requires sufficient knowledge of the ecosystem and possible changes and the consequences of any interventions. To adapt here means to make modifications suitable to local conditions. Uncertainties here are already being embraced within management and planning processes in ecological restoration (Darby and Sear 2008; Rehr et al. 2012; Nagarkar et al. 2016).

On the other side, an uncertainty is introduced from value diversity (Pahl-Wostl 2006). Values are enduring beliefs about desirable end states or qualities of life (Rokeach 1973) and can also be seen as standards or criteria for evaluation or selection of actions, people, policies and practices (Schwartz 2006). Value diversity implies that we may hold a variety of values, individually and collectively. In the context of restoration, values may concern what kind of restoration is desirable and why (Gamborg & Sandøe 2005). Lack of clarity about what values different stakeholders adhere to, or which values to act upon in situations of value diversity may give rise to uncertainty.

This may in turn cause disagreements between contending parties (Reed et al. 2018). Such uncertainty or disagreement, with its normative aspects, has received less attention (Reed et al. 2009; Palmer et al. 2014; Petursdottir 2017). Its management requires knowledge of stakeholders' attitudes to ecological restoration, and more generally, an understanding of what stakeholders see as the 'right' kind of restoration. Attitudes or views can be defined and understood in many ways, but at the core of the concept is some kind of evaluation of people's surroundings (Manfredo, 2008).

According to a hierarchical belief structure, attitudes lie in the middle of a hierarchy, with our values at the bottom and behavior at the top. Maris & Bechet's (2010) work on biodiversity conservation, and their use of the term 'adjustive management', suggested that an improved

understanding of stakeholder views and values could pave the way for a successful approach to ecological restoration which adapts not only to developments in ecological and economic conditions, and advances in our understanding (Grygoruk & Rannow 2016), but also to diversity or shifts in stakeholder's values, attitudes and goals. In this sense, 'adjustive' refers to settling or bringing the management of a restoration process to a satisfactory state, so that parties agree about the outcome (cf. Pruitt & Kim, 2004).

The aim of this paper was to investigate attitudes, values and participation in ecological restoration, and to explore whether a continuous involvement process would allow stakeholders and project managers to identify and carry through adjustments of ecological restoration taking into account the values of the parties involved. Using a four-year case study of riparian landscape restoration on privately owned land with public access, we addressed four questions. The questions were related to the interventions and expected outcome of the restoration efforts and to the processes of involvement and value adjustments: (1) What were stakeholders' views on ecological restoration in general? (2) What expectations did they have about the outcome of the restoration in this specific project? (3) What views did stakeholders' take on the involvement processes? (4) Did their views gave rise to adjustments of the ecological restoration, and did they adjust their views during the involvement process? The results are used in a discussion of the feasibility of the term 'adjustive ecological restoration'.

Methods

Study area

For centuries, an uninhabited central part of the Danish Baltic island Bornholm (app. 588 km² and 40,000 inhabitants) was used as common land with grazing and fire wood collection rights.

Degraded habitats with large, treeless, nutrient-poor heathlands developed, and to rehabilitate the land afforestation programs were initiated from the mid-nineteenth century and onwards. Most areas were planted with the non-native Norway spruce (*Picea abies* Karst.). Responsibilities and usage rights were allocated among parishes.

The longest stream on the island 'Øle Å' is 22 km and fed from a calcareous wetland in the central area and runs for more than 4 km through forested land, which today is privately owned but with extensive public access. The stream seems to be almost undisturbed from human activity, but the intensive coniferous plantation in most of the catchment with some trees even planted on the banks of the stream, has had a significant impact on the water flows, the light regime, nutrient cycling, the riparian flora and fauna, and visitor experience (Figure 1).

A scientifically motivated ecological restoration project was initiated in 2013 along the upper 4 km of the stream to put an end to the dominance of near-stream intensively managed spruce. With a broad 'Before-After-Control-Impact' monitoring approach (Stewart-Oaten et al. 1986, Conner et al. 2016), spruce trees in the riparian zone in close proximity to the stream (up to 30 m) were felled and removed in autumn 2014, leaving the area next to the stream to free succession. The project involved an area with just one private owner, and was managed by a team of restoration researchers in forest ecology, freshwater biology and social science.

Stakeholder involvement

At the initiative of the landowner, stakeholders from local NGOs and local authorities were engaged in an advisory group, called 'The Green Partnership'. The Partnership consisted of 35 members, with representatives from nature conservation NGOs (e.g. BirdLife Denmark), special interest groups (e.g. mycologists, anglers, and cultural historians), outdoor recreation development representatives, regional development representatives, and the local Forest and Nature Agency. Organization representatives became part of the Partnership on a voluntary basis and received no economic funds for participation or for travel costs. The composition of the resulting Partnership was a result of a series of dialogues over a year between the private land owner and prospective members on a bilateral basis to establish who would be interested and willing to join this kind of partnership. In addition, some members joined on the suggestion of other members. The Partnership was not further sub-structured, and all members were essentially on an equal footing in terms of participation.

Members of the Green Partnership participated in the restoration project in different ways: 1) commenting plans, contributing with local knowledge, advancing viewpoints and giving concrete suggestions for the restoration, either at scheduled meetings or in between meetings, and 2) participating as a kind of citizen scientists, e.g. biodiversity monitoring and mapping of historic cultural artefacts, or by taking action, e.g. maintaining nest boxes for the boreal owl (*Aegolius funereus*). The Partnership met once or twice a year between 2013 and 2017. At the meetings progress on the project, relevant management decisions and news from the land owner was usually given, followed by an open, plenary debate facilitated by members of the research team, allowing

potential disagreements and differences of opinions in relation to scientific and technical aspects to be brought up. The aim was to clarify whether the progress reports and management suggestions gave rise to additional measures, allowing the Green Partnership to contribute with knowledge, views and suggestions for adjusting restoration activities. Although the Partnership had no formal decision-making power, as the private land owner essentially has the decision making authority, the Partnership was encouraged to actively engage in producing an overall vision for the entire forest and riparian area, which, among other things, led to the stream restoration project reported in this paper.

Analysis of stakeholder views

Inspired by Bryman (2008), we combined individual questionnaires and content analysis of meeting minutes to balance self-completed answers with major concerns in plenary Partnership discussions.

A questionnaire investigated respondents' experiences with and attitudes to the project including the involvement process. The questionnaire was divided into three substantive sections: (a) Views on nature and interests in Øle Å, (b) Attitude to ecological restoration and specific interventions, and (c) Involvement in the restoration project. In addition, two smaller sections dealt with background information and interests in future project involvement. Informed consent was granted by participants to use the results from the questionnaire in anonymized form for research purposes only.

The questionnaire was pilot tested on five participants that for other reasons could not participate in the full survey in order to identify questions that could be difficult to understand, would not make

sense to participants, or pinpoint problems with the questionnaire that might lead to biased answers. Most of the 58 questions were closed with defined response options to make comparison possible and to be able to quantify responses. A number of the questions included answer options using a five-point Likert scale. For simplicity, results were obtained by descriptive statistical treatments and are presented on aggregated scales with three options. To allow respondents to elaborate on the closed ended questions or to complement answers, open-ended questions were also used. Answers were analyzed in terms of content where they could help to interpret or complement quantitative results of the survey or to connect to plenary discussions. Results from these open-ended questions are presented as quotes, in addition to survey data in tables. The questionnaire was sent to the 35 stakeholders participating in the Green Partnership, and 22 responded (63%). The survey was conducted in June 2016 using an internet-based questionnaire prepared in SurveyXact (see Appendix A) and two reminders were issued.

We used formal minutes of Partnership meetings to analyze the involvement process, and to uncover concerns and values at stake and derived adjustments. Minutes are public and available on the project website (www.olea.ku.dk/english). Subjects raised and discussed were aggregated into five categories (aesthetic, ecological, historic, process, and restoration philosophy). On the basis of the concerns, we analyzed the nexus of discussions and where adjustments to restoration activities were made. We defined three types of possible adjustments: (1) the project managers adjusted their activities based on stakeholders' raised concerns and values, (2) stakeholders modified their values and views based on inputs from project managers as the restoration project proceeded and they took

part in the project, and (3) shifts in views within the stakeholder group from exchanges with other stakeholders involved in the project (Figure 2).

Results

Views on ecological restoration and on restoration activities

The majority felt that the project had a positive or very positive impact on a number of elements and processes in the long term (Table 1), such as forest (95%), fish stocks (89%), the aquatic environment (89%), as well as so-called free ecological processes (84%). Very few respondents (5-16%) expected negative effects of the restoration in the longer run.

A substantial majority (84%) agreed that the trees and shrubs growing along the stream should be cleared (Table 2). Those who indicated their support for clearing of trees and shrubs gave a number of reasons referring to visual and cultural aspects: *“Trees are beautiful, but open areas are also nice for changing nature”*; *“To ensure that there is an open-light area and... ‘Danish’ species”*; and *“For landscape and cultural reasons”*. They also cited broader biodiversity issues: *“To control the species composition”*, or simply *“To increase biodiversity”*. A small proportion (10%) believed that trees and shrubs should not be cleared along the stream. Some explained their reservations by referring to the suddenness and ‘unnaturalness’ of the process: *“The very sudden and brutal clearance also gives rise to rejuvenation that becomes very close and impenetrable. It is not a natural or dynamic change of nature that has happened”*. Others focused on changes to the stream: *“There has been huge damage to the water course. This has become too hot due to the solar radiation. There has been filamentous algae and at times reduced oxygen”*.

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A majority of respondents (63%) responded negatively to the question, whether aquatic weeds should be cut back. The reasons they gave referred to the maintenance of natural processes so that the area “*may develop as naturally as possible*”, and to the idea that interventions should be based on sound ecological knowledge: “*The issue is the total lack of understanding of stream biology. The lighting of the stream has caused major damage to the watercourses*”. A smaller proportion of respondents (31%) thought that aquatic weeds should be cut back because of the visual aspect: “*the stream may become completely overgrown. Several of the bogs are soon grown over. I want to see some water.*” Another reason given referred to the stream’s ecology: “*Perhaps. Only if the crop grows so much that it may bother the life of the stream.*” When asked about the removal of dead branches and trees in the stream, the majority (68%) felt that it should not happen because that would involve interfering with the ecology of the stream, creating a “*more unnatural wetland*”, and because “*... falling branches and trees contribute to the dynamics of the stream*”. Only 27% believed that the branches and trees should be removed, for example because dead trees and branches could “*... bother the fish and water flow*”.

Just over half of the respondents (58%) believed the river area should be left alone, free of interventions. They cited visual aspects, for example, “*I do not like manicured areas*”. More guardedly, they referred to ecological aspects: “*... if the stream develops so that there is a positive development for fish, animals and plants. Otherwise, one must help a little*”. Several added that it was important to follow the development closely if the area was to be left to itself. A smaller number of respondents (37%) believed the river area should not be left unmanaged, among other

things because “... *foreign species should be removed*”. Opinions about how important it was to leave the area to free succession were more complex. Just over two thirds (68%) of respondents said it should be left alone, but 63% indicated that it would be important to intervene and control the development. One-third (32%) did not think that control of the development should be continued. The reasons given for controlling the development included “*only if it turns out to be necessary*” and it was noted that “*there is a big difference in controlling the development and simply observing development*”. About half would have preferred a nature management project characterized by recurrent interventions and tweaking of ecological processes.

Finally, respondents were asked about their perception of ecological restoration as such, and whether the participation process had changed their views on ecological restoration in general (Table 3). Overall, the vast majority (90%) thought that the specific restoration so far had been successful. About two thirds (63%) felt that participation in the process had helped to change their view of the specific restoration area. However, participants did not volunteer information about their former views. About half also thought that the project had changed their view of ecological restoration in general, with about two-thirds becoming more positive during the four-year project period (result not shown).

Views on the involvement process

The majority of participants (74%) responded that they could add viewpoints representing a specific interest. Several also expected to present viewpoints of a specific organization (47%) or contribute with specific knowledge of relevance to the utilization of the project area. Participants’ anticipated

gains including ‘information about’ (89%), ‘influence on’ (42%) and ‘controlling of’ (26%), the ecological restoration process (results not shown). A slight majority (55%) felt that the project’s managers had been open to input and were convinced that their special knowledge and viewpoints had at least partly been incorporated into the project (Table 4). Moreover, nearly all participants viewed the Green Partnership as representative of ecological restoration interests. Most participants did not see the activities that were actually carried out during the project as a digression from those originally planned. However, an overwhelming majority (95%) had not expected digression of that kind. In addition to the results presented in Table 4, most participants completely (54%) or to some degree (38%) felt that it had been worth being involved in the participation process. A clear majority felt that the involvement had worked ‘very well’ (33%) or ‘well’ (56%), and most would ‘clearly’ (50%) or ‘probably’ (33%) consider joining a similar project with the same kind of participatory set up (result not shown).

Concerns and values raised at meetings and subsequent adjustments

Meetings between the project managers, the forest owner and the Green Partnership involved a variety of topics presented and discussed, reflecting five categories of concerns (Table 5). In response to concerns raised by stakeholders, adjustments were applied to project management in three ways (Table 6). We identified a number of key values reflected in stakeholder inputs: From more narrow ecological, aesthetic and cultural values to a broader set of values connected to restoration philosophy and restoration process. As an example, in response to ecological concerns or values from the local association of mycologists for the previously reported red-listed (EN) fungus *Lactarius scrobiculatus* associated to Norway spruce, care for this species was incorporated

in the placement of control areas, representing a type 1 adjustment (Table 6; Figure 2). Stakeholders were also observed to change their views on key concerns. As an example, ecological concern over fish migration possibilities in the perspective of un-handled dead branches in the stream was a recurrent concern raised by anglers during the early meetings. Through continuous discussions and joint field work, project managers provided further facts and balanced this concern, representing a type 2 adjustment. Finally, stakeholders were observed increasingly recognizing the complexity of ecological restoration during Partnership meetings through the myriad of concerns raised by other specialized stakeholders, as such suggesting a type 3 adjustment.

Discussion

Restoration activities and stakeholder involvement

Our results showed more or less consistently that respondents had positive expectations about the potential long-term outcome of the project for nearly all aspects of the ecosystem. The validity of this response can be questioned, however. First, an exact time horizon was not specified in the questionnaire. Furthermore, participants might have overestimated the positive impact of the restoration project simply because of being involved in the project (Jähnig et al. 2011). The positive attitude exhibited in the present study could be regarded as an expression of trust, both in the self-restoring ability of nature as such and in the project idea and the management team. Furthermore, somewhat contradictory views on restoration were revealed, accepting recurrent management but also expressing wishes of allowing the area to take care of itself. Nature projects in Denmark ordinarily have very fixed targets for such matters as species composition, and typically, some kind of recurrent management is normal, often driven by the EU Bird and Habitat directives (Morsing et

al. 2013). The open-ended approach described by Hughes et al. (2012; 2011) may be seen as a move in a new direction, with greater emphasis on dynamics and processes (Hughes et al. 2011) and a focus on function rather than form (Friberg et al. 2016). It would appear that this approach is one that stakeholders and green organizations are only now becoming familiar with. Holl et al. (2017) calls for stable involvement processes like those implemented for four years in the Øle Å project as a way to reach agreement on dynamic targets. In the open-ended approach it is important to follow the development carefully (Hughes et al. 2011), as was agreed upon by the stakeholders in this study. Through such monitoring it was documented that the riparian felling had indeed brought about a 7 to 15-fold rise in light availability around the stream and some filamentous algae development, but also that it had created better oxygen conditions during low flow periods, where hypoxia was previously a problem (Kallenbach et al. 2018).

Measures of community involvement are very useful, but they are rarely used in evaluations of restoration success (Wortley et al. 2013). Evidently, what counts as a success is a normative discussion, besides the technical typically addressed. One criterion could be the level of satisfaction of stakeholders participating in terms of e.g. perceived accordance with their aspiration, interests and values. Another, more common criterion could be fulfillment of restoration goals or satisfaction of the project holder, which would be either the land owner or the participating restoration ecology researchers. The stakeholders in this study felt that they together brought into the project a representative group of interests and knowledge, indicating a perceived legitimacy of the partnership. This is positive given calls for more stakeholder involvement (Marttila et al. 2016) and

the facilitation of stakeholder cooperation (Blicharska & Rönnbäck 2018). We found no similar cases in the literature.

Results regarding ‘views on’ and ‘experiences with’ the involvement process indicated that the process was perceived as cooperation. Indeed, ‘cooperation’ of the sort formulated in conflict resolution theory includes as key elements effective communication, helpfulness, positive attitudes and trustworthiness (Emborg et al. 2012). A possible obstacle to this is lack of skills in planning participatory processes (Brown et al. 2010; Reed et al. 2018). However, in the present case, the project management team, the forest owner and stakeholders worked to initiate and maintain a positive and effective relationship between the parties involved. It seems reasonable to say that such actions show confidence, openness and helpfulness (Daniels & Walker 2001). They tend to lead to an improvement and strengthening of relationships (*ibid.*). The questionnaire responses suggested that primarily the stakeholders wanted information. In this sense, the so-called relationship dimension of a (conflict) situation was addressed (*ibid.*). With regard to the so-called procedural dimension, their desire for influence and control was less pronounced. According to Danish law, public restoration projects and other land use planning projects over a certain size, and depending on circumstances (e.g. who or what are affected) are required to have some sort of public hearing. The extent to which influence is expected would seem to depend on the planning culture in a given country. However, in this particular case, expectations also seemed to depend on the relation with the land owner, and the kind of expectations discussed at the outset of the project, as can be seen from the first Green Partnership project meeting (Table 5).

Adjustments identified

Although only a minority of stakeholders reported to have been the base for possible changes in activities or interventions, adjustments to project management were applied on the background of their input, representing type 1 adjustments. This can be construed as adjustive management in practice (cf. Maris and Béchet 2010). Type 2 adjustments among stakeholders based on project management, may reflect a discussion about how much attention should be given to historical fidelity, as discussed by Higgs et al. (2014), and how frequent interventions should be. Essentially, the question is whether restoration activities should be seen as projects delivering a return to something historical or as the creation of something new, so-called ‘novel ecosystems’ (Hobbs et al. 2009; Lennon 2016). In concert with this discussion, restoration monitoring needs to ask how these views will resonate with stakeholder values and their potential shifts over time. A way to facilitate type 2 adjustments may be through effective communication of the information produced by science to stakeholders (Grygoruk & Rannow, 2016), or enabling a two-way dialogue such as seen in this continuous involvement process. Finally, an interchange of values was observed between the stakeholders themselves (type 3). In many cases, a question raised during discussions was which values should prevail, broader ecological values or more human-centered values, such as historical or aesthetic values (cf. Gobster et al. 2007). This may have created a greater awareness of the complexity of the concerns playing into ecological restoration, which in turn, may have led to some value adjustments among those involved.

How feasible is adjustive ecological restoration?

The types of adjustments defined and experienced during the present case is but one interpretation of what happened. In some cases there may be a combination of adjustment types on the basis of presented concerns or values and on the basis of knowledge claims, which can be difficult to disentangle. An adjustment enabling approach would need to work according to the assumption that the integration of people's value systems, cultural traditions and socio-economic activities in ecological restoration is a cornerstone of nature management (Wu & Hobbs 2002). This kind of ecological restoration approach would also have to embrace the need for attending to the so-called human dimension of restoration (Souder 2013). As such, adjustive restoration can be seen in complement to the well-established concept of adaptive management. The notion of adaptive management has been interpreted in various ways, e.g. Holling (1978) and Lee (1993), but emphasizes learning about ecosystems and processes and uncertainty about ecosystem developments, and essentially deal with the knowledge level required for successful ecosystem management (Lee, 2001). Adjustive restoration includes the same aspects, but adds new components to learning and uncertainty. It also implies learning about human views on interaction with ecosystem and values related to the natural environment, and it includes uncertainty about what those values are, and how they might be in disagreement with the values of those planning and managing ecosystems interventions and with other stakeholders' values.

The establishment of a genuinely adjustive approach is likely to face two sets of challenges. One set has to do with the methods and outcome of ecological restoration, and here the fundamental issue is whether to intervene at all, and if so, how, and for how long? This introduces a more profound debate about the values associated with nature (Reed et al. 2009), and further questions about how

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to best accommodate this debate in a collaborative way (Jähnig et al. 2011). Secondly, an adjustive approach could be challenged by the process of involvement. Here a number of obstacles affecting participants and project management of the type seen in cases of French river restoration (Morandi et al. 2014) need to be recognized. With regard to the participants, one challenge is how willing and able they are to be engaged in and to influence sometimes technically and scientifically complex discussions and decisions (Daniels & Walker 2001). There will probably be quite a distance between lay and expert parties in joint decision-making processes. Being able to speak up seems to require a degree of mutual trust. In the Øle Å project, the very thorough ‘recruitment’ process and the stable engagement process may have established this level of trust. The results here suggest that joint endeavor is achieved through the establishment of committed partnerships. Challenges for project management include the ability and willingness to listen and change. Although this seems to be self-evident, a process like the one in this project does need to avoid a classic involvement pitfall of superficial involvement on the lower steps of the ladder of participation (cf. Arnstein 1969) reflecting tokenism or even manipulation.

Evidently, there is no threshold to determine when an ecological restoration could be called ‘adjustive’. Moreover, it is seemingly difficult to make a “causal” attribution of changes in restoration management or changes in other stakeholders’ views. Decisions are often made on the basis of a number of factors besides direct or indirect value-based inputs, including ability to act, judgement of efficacy of a decision and perceived behavioral control, cf. Manfredo (2008).

However, it seems reasonable to call ecological restoration ‘adjustive’, if it includes a genuine search for an understanding of stakeholder views and values, and a willingness to adjust. Finally, an

adjustive approach should be documented based on monitoring and reporting of social processes (Nilsson et al. 2016). The evidence of the present restoration project suggests that the creation of such a foundation depends on at least four enablers: (a) the ability to work with stakeholders, and to record their views, values and concerns, (b) a willingness to adjust values and restoration activities, (c) high levels of trust between the parties involved, and (d) the levelling of expectations e.g. about just how much influence can be exerted. Mutual benefits and a more shared view of ecological restoration were observed in the present case, and we suggest that this approach is best described as adjustive ecological restoration.

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Table 1. Stakeholder expectations to the ecological restoration's long-term effects.

What effect do you expect the project will have in the longer run on...	Somewhat positive (%)	Either/or (%)	Somewhat negative (%)	No influence (%)
Landscape?	90	11	0	0
Forest?	95	5	0	0
Forest management?	53	47	0	0
Aquatic environment?	89	5	5	0
Climate adaptation?	63	32	0	5
Birdlife?	90	11	0	0
Fish stocks?	89	5	5	0
Other wildlife?	79	11	10	0
Plants in the stream?	90	5	5	0
Plants on land?	89	11	0	0
Free ecological processes?	84	11	0	5
Geological conditions?	26	58	16	0
Cultural historic issues?	48	47	5	0
Outdoor recreation?	79	21	0	0
Your own use of the area?	84	16	0	0

Table 2. Stakeholder attitudes to specific ecological restoration activities.

Are you of the opinion that...	Yes (%)	Either/or (%)	No (%)
Growth of trees and shrubs along the river should be cleared?	84	6	10
Weed-cutting of aquatic plants should take place?	31	6	63
Dead branches/trees in the river should be removed?	27	5	68
The area should be left without interventions now?	58	5	37
There should be continued control of the development of the area?	68	0	32
It would have been better with a 'conventional' nature management project with recurrent interventions?	47	21	32

Table 3. Attitudes and possible changes in attitudes, to the specific ecological restoration and ecological restoration in general.

	Yes (%)	Either/or (%)	No (%)
All in all, are you of the opinion that the Øle Å project – so far – has been successful?	90	0	10
Has your participation in the process of the Øle Å project contributed to changing your view of the stream and the surrounding landscape?	63	32	5
To what degree has the Øle Å project influenced your attitude to ecological restoration in general?	58	37	5

Table 4. Stakeholder views on the involvement process in the Øle Å project.

Are you of the opinion that...	Yes (%)	Either/or (%)	No (%)
The ecological restoration project has been responsive to your views?	55	33	12
Your special knowledge or competence has been included in the project process?	44	33	12
The people and organisations that participate are representative of the interests in the Øle Å project?	95	0	5
Restoration activities or interventions which were not part of the original project, as you understood that project, took place?	10	37	53
Possible changes [in activities or interventions] have been made on the basis of your, or others' participation?	21	47	32

Table 5. Overview of topics in relation to the Øle Å ecological restoration at meetings in the Green Partnership from 2013 through 2016, and reflected concerns/values.

Meeting no. (year)	Meeting topic	Reflected concern/value (aesthetic, ecological, historic, process, restoration philosophy)
1. (2013)	Expectations to the project implementation, effects and communication Level of intervention (spatial), now and in the future (closing of ditches, spruce -> deciduous conversion etc.) Monitoring perspective (spatial and thematic) and involvement of Green Partnership Cultural historic artefacts and forestry practices, and the restoration project Expected communication and potential collaborations, and webpage Timing of the intervention, and how to limit the potential harmful consequences (heavy machinery vs. by hand, all at once vs. stepwise felling, winter vs. spring felling)	Process Ecological, restoration philosophy Ecological, process Historic Process Process, ecological, historic
2. (2013)	Early monitoring results on stream dynamics and the fish population Intervention plan presented Existing biodiversity, anthropogenic disturbances and similar projects Fish passage at downstream weirs Communication	Ecological Process, ecological, historic Ecological Ecological, restoration philosophy Process Ecological
3. (2014)	Monitoring overview (before intervention) Presentation of social scientific investigations Intervention planning Mapping of cultural historic artefacts Possibilities for communication Effect of instream dead wood and fish passage Water quality in upstream bog	Ecological Process Process, ecological, restoration philosophy Historic Process Ecological, restoration philosophy Ecological Ecological
4. (2015)	News on social scientific investigations	Process
5.	Follow up on the felling	Ecological, historic,

(2015)	Early monitoring results on birds, nutrient leaching, stream metabolism and spontaneous and manipulated vegetation development	aesthetic, restoration philosophy, process Ecological
	Status on communication of the project	Process
	Wildlife grazing	Ecological
	Future communication	Process
	Fish passage of downstream weirs	Ecological
	Monitoring possibilities into the future	Ecological, process
	Public path placement, and the access for mountain bikers and horse riders	Process, aesthetic, historic
	News on social scientific investigations	Process
	News on rare owl breeding status	Ecological
6. (2016)	Visit to and introduction to the state owned reserved Ølene, from where the Øle Å origins	Ecological
	Visit to the Øle Å project area, introduction to monitoring equipment, look at cultural historic artefacts and look at traces from the intervention	Ecological, historic, aesthetic, restoration philosophy, process
7. (2016)	Results on stream metabolism	Ecological
	Trout population survival under anoxic conditions	Ecological
	Short term effects of the intervention on light and nutrient levels	Ecological
	Continuation of monitoring the coming years	Ecological, process
	News from green organizations on biodiversity and management	Ecological

Table 6. Types of adjustment observed reflecting different concerns or values.

Type of adjustment	Adjustment	Reflected concern or value
In project management, based on stakeholders (1)		
	<ul style="list-style-type: none"> • Change in the timing of key intervention. 	Process, ecological
	<ul style="list-style-type: none"> • Inclusion of Green Partnership in monitoring activities. 	Process
	<ul style="list-style-type: none"> • Care for rare fungi in intervention plan. 	Ecological
	<ul style="list-style-type: none"> • Mapping of and care for stone bridge and sunken lanes in intervention plan. 	Cultural
Among stakeholders, based on project management (2)		
	<ul style="list-style-type: none"> • Focus on restoration development as open-ended, with temporal changes in site appearance. 	Ecological, restoration philosophy
	<ul style="list-style-type: none"> • Recognition of balanced effect of in-stream deadwood on fish passage. 	Ecological, restoration philosophy
Among stakeholders based on stakeholders (3)		
	<ul style="list-style-type: none"> • Increased awareness of the complexity in ecological restoration, e.g. care for cultural artefacts. 	Ecological, historic, aesthetic, restoration philosophy, process



Figure 1. The headwater stream Øle Å runs through privately owned plantations. Most of the area subject to restoration was previously used intensively for timber production with Norway spruce (left, degraded). Other largely untouched stretches function as a guiding image (right, reference).

Photos from September and June 2014 respectively by Jonas Morsing.

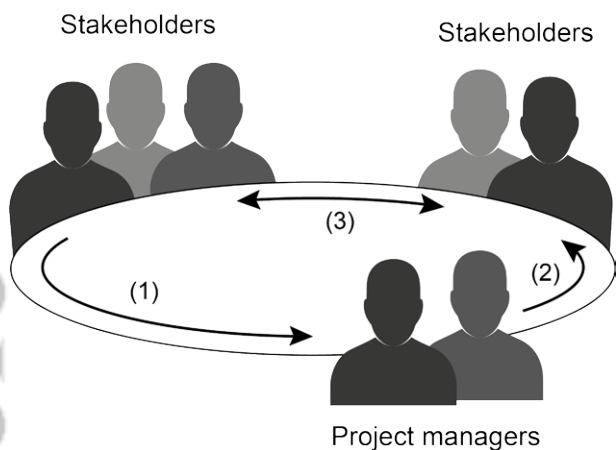


Figure 2. Possible types of adjustments within an ecological restoration project: 1) the project managers adjusting their activities based on stakeholders' raised concerns and values, 2) stakeholders modifying their values and views based on inputs from project managers, and 3) shifts in views within the stakeholder group from exchanges with other stakeholders